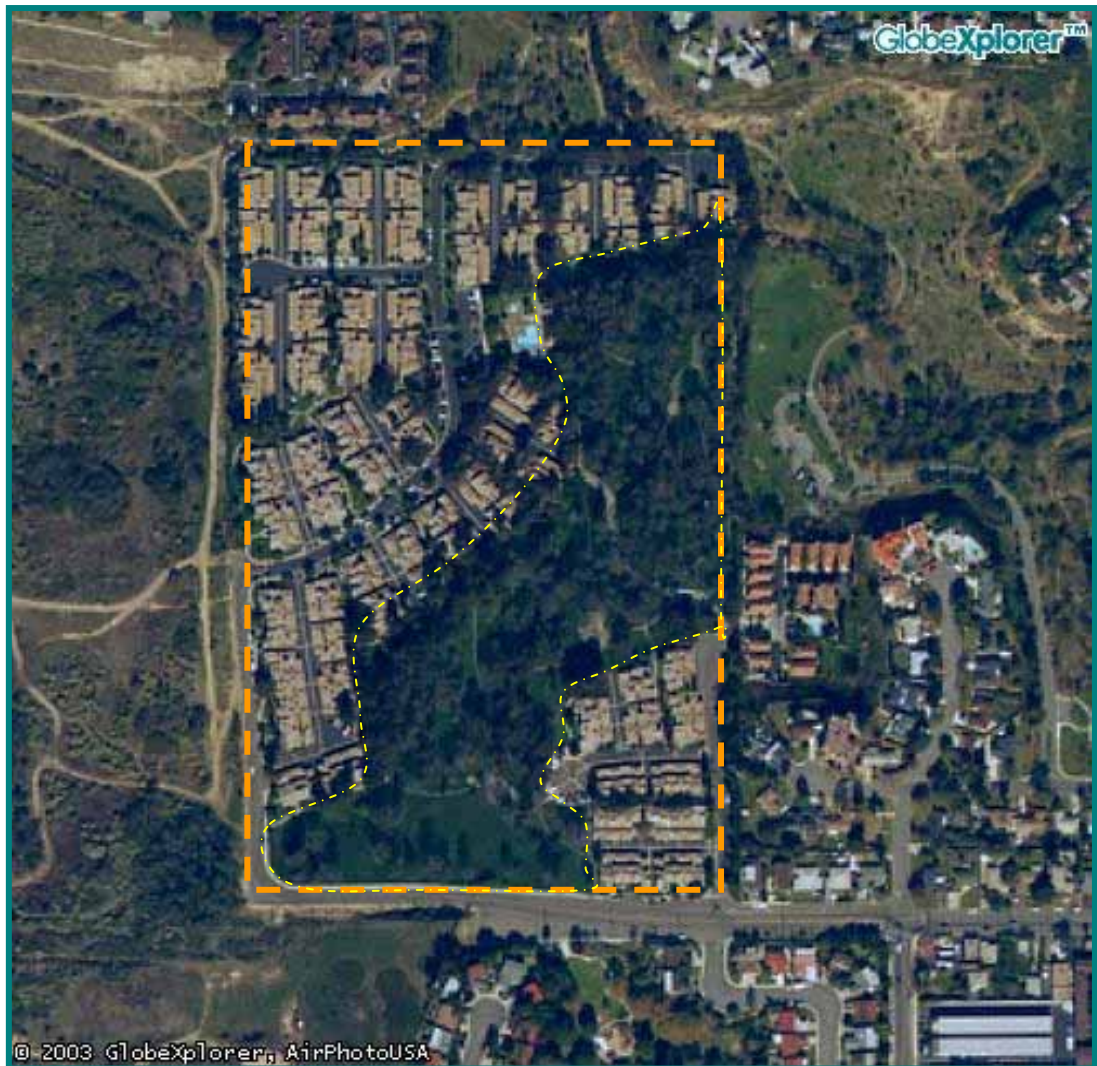




Gas Monitoring Report (Continuous Gas-Detection System) Newport Terrace Landfill

West 19th St. Dead End, Newport Beach, CA 92663



March 2003

Prepared By:
California Integrated Waste Management Board
P.O. Box 4025
(1001 "I" Street)
Sacramento, California 95812-4025

SWIS # 30-AB-0168

SUMMARY

The California Integrated Waste Management Board (CIWMB), Closed Illegal and Abandoned Site Unit (CIA), investigates solid waste disposal sites and provides site data and documentation to quantify requirements for both enforcement and potential clean-up activities by the CIWMB Solid Waste Cleanup Program (AB 2136).

The CIA unit, has prepared this report on behalf of the Orange County Local Enforcement Agency with regard to the continuous gas monitoring system installed adjacent to the condominiums at the Newport Terrace Landfill (SWIS # 30-AB-0168) located in West 19th St. Dead End, Newport Beach, CA 92663. This report includes methane gas readings taken at 10 different locations using catalytic sensors controlled by a 10 multi-channel sensor controller; see Appendix A for sensor location.

The purpose of continuously monitoring the site at the structures was to verify that concentrations of methane gas generated by the landfill were not exceeding 25 percent of the lower explosive limit as a result of the gases migrating away from the landfill. The structures monitored are located 300 feet away and to the west of the landfill.

Methane gas readings were taken every hour, 24 hours a day for a period of 18 months from July 10 of 2001 through December 10 of 2002. Readings collected are attached along with this report in Appendix C. None of the readings were found to be above the regulatory limits for methane gas in facility structures. Even though some of the readings recorded by the logging system showed high concentrations of methane gas, it was later found after detailed inspection that the readings were due to one of the sensors that needed calibration.

SITE LOCATION AND DESCRIPTION

The site is located in West 19th St. Dead End, Newport Beach, CA 92663.

Latitude: 33.645

Longitude: -117.94472

Surrounding Land: Residential

Enforcement Agency: County of Orange (Health Care Agency/Environmental Health Division)

LEA (Dean Clarke) Phone #: (714) 667-2023

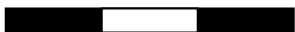
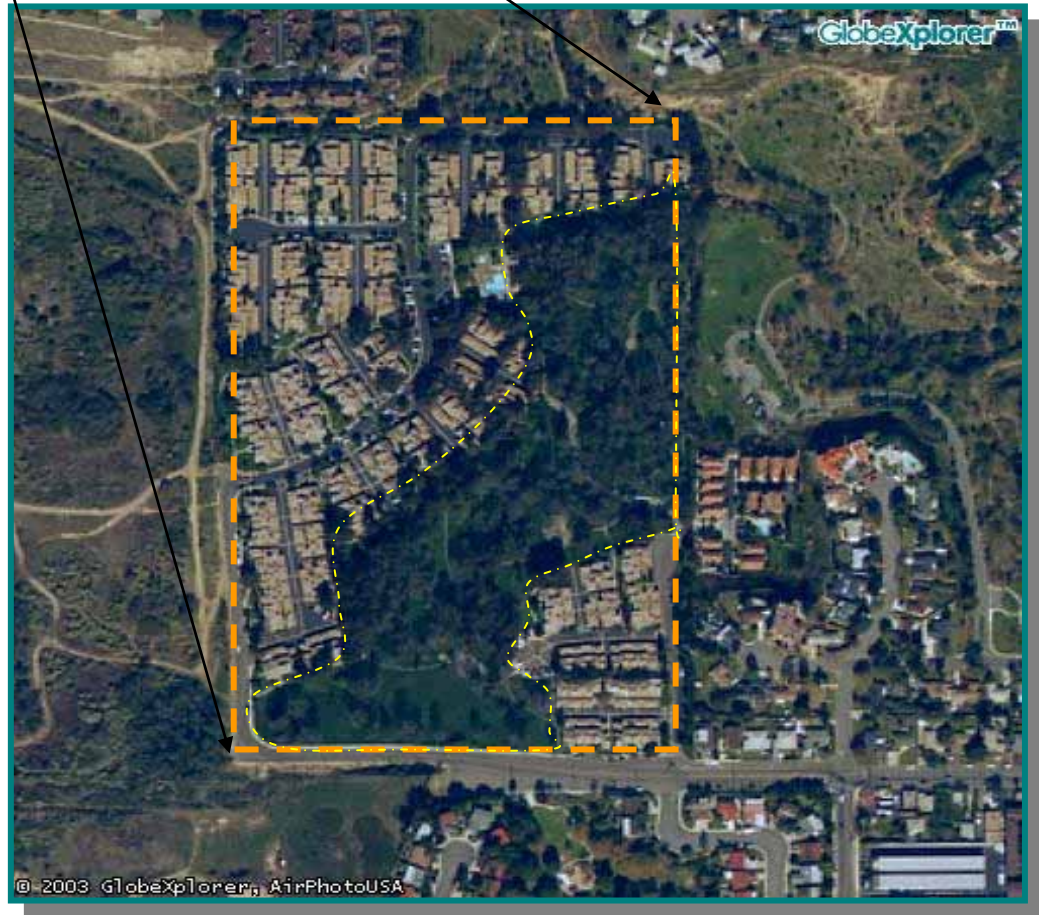
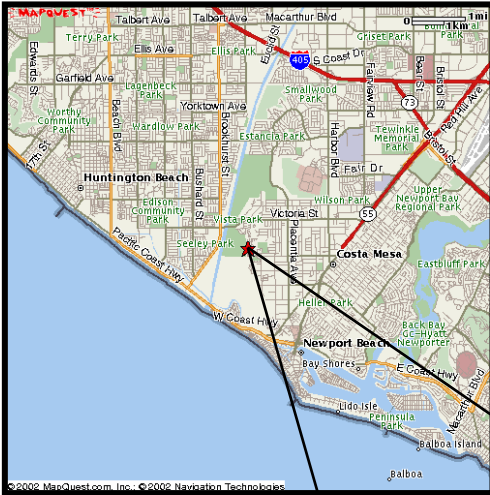
Activity: Solid Waste Disposal Site

Status: Closed

Closure Date: 1967


Insp. Frequency: Quarterly

Issues: Continuous violations of the gas rule (CCR 20919 Gas Control)



Not to Scale



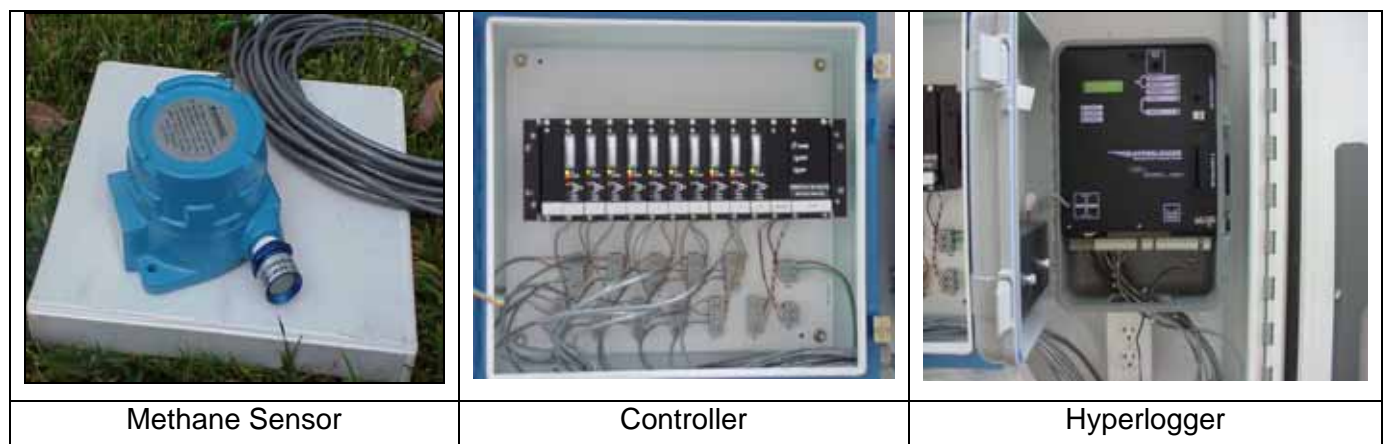
 California Integrated Waste Management Board Permitting & Enforcement (Closed Illegal and Abandoned Sites Unit)	
Prepared By: AMC	Site Location Map Newport Terrace Landfill Newport Beach, CA 92663
Date: 2/20/03	

MONITORING APPROACH

In July of 2001 the CIWMB, in conjunction with its environmental consultant BAS (Bryan A. Stirrat and Associates), completed the installation of a continuous gas monitoring system. The objective was to monitor landfill gas migration into the structures located near the old Newport Terrace Landfill. A total of 10 methane sensors were strategically located around the condominiums in the west side of the facility 300 to 500 feet away from the footprint of the landfill. The location of the monitoring net can be seen in Appendix A.

The system used for this purpose was the USI Multi-Channel Gas Leak Detector/Alarm that consists of two separate portions: the gas sensors (Methane 0-5 % vol.) catalytic, diffusion type and the controller, see pictures below. The gas sensors were found to be very reliable, providing fast response. The system controller is a compact, rugged, and lightweight unit that consists of 3 portions in a 19" rack (10 Channels): The power Module, Master Module, and Individual Channel Module.

The gas detection system was also equipped with a data logging system that allowed collection of data. The logging system used was the Hyperlogger by Logic Beach Incorporated, which is a battery/AC operated portable data logging and control system that was left at the site to collect data from the sensors. The data was mathematically processed by the Hyperlogger and stored in its internal memory while simultaneously performing basic onsite alarm and control functions. The collected data was then transferred to a remote PC via modem for data display and analysis. The communication between the Hyperlogger and the remote PC proved to be highly versatile, allowing graphic data display and real-time tracking.



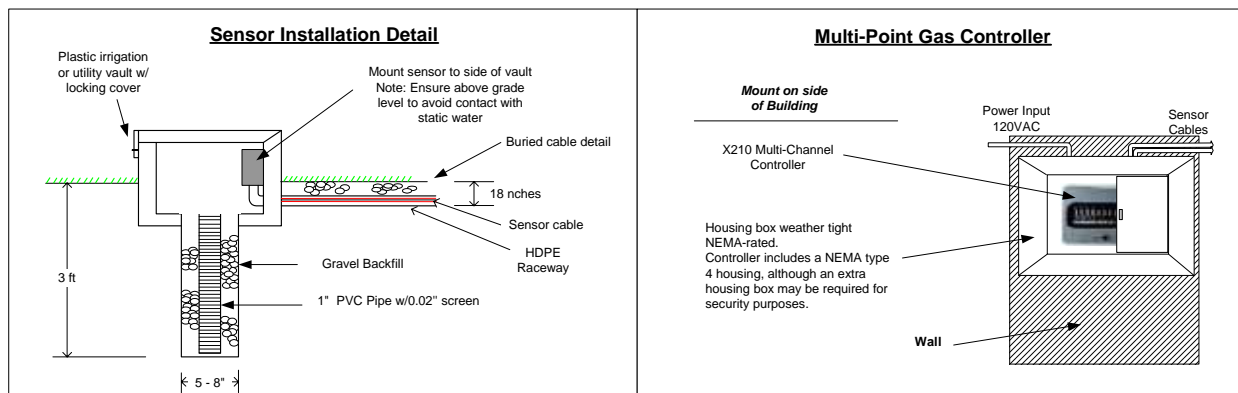
DESCRIPTION OF FIELD SAMPLING

The potential for gas migration to occur given the vicinity of the condominiums to the old landfill, dictated the need to continuously monitor landfill gas near structures. As seen in this diagram the condominium units selected to be monitored are located 300 feet away and to the west side of the old landfill's waste footprint. The monitoring net nearly covered an area of 2 acres with a total of 10 sensors installed in place.



The installation of the sensor was done using plastic irrigation boxes.

The boxes were used to enclose and mount the sensors that were at the same time fed by air mixtures being drawn from the ground by a PVC pipe installed underneath the irrigation boxes. The idea behind this sensor installation layout was to simulate the operation of a shallow gas-monitoring probe installed 3 to 5 feet bgs feeding air mixtures into the irrigation box. If landfill gas was to migrate from the landfill area into the condominiums where the sensors were placed, the gas would immediately be detected and a signal would also be sent into the controller to activate an alarm and store the data read by the sensor. The below diagram better describes the installation of the sensors in the field; see Appendix A for additional details.



The versatility of this system consisted of the ability to modify monitoring schedules via modem. Once the whole system was put in place, CIWMB staff was able to access the hyperlogger located in Newport Beach via a PC located in EPA headquarters in Sacramento. Originally the system was programmed to read gas concentrations from each one of the 10 sensors every hour, 24 hours a day during 12 months. At the end of the monitoring program CIWMB staff ended up collecting data for a total of 18 months, December of 2002 was the last month when data was collected.

The following are the gas monitoring procedures established using the continuous gas monitoring system:

1. Monitoring Locations:

A total of 10 methane sensors were installed at this site, see Appendix A for sensor location.

2. Monitoring Programs:

July/2001 – March/2002

- a. The logging system was programmed to read and store gas concentration readings every hour, 24 hours a day.
- b. Remote communications with the system were established on a weekly basis to monitor the operation of the system, perform data analysis, and real-time tracking.
- c. Download of stored data was done on a monthly basis via remote communication. The data was analyzed and organized using Microsoft Excel.
- d. The system was calibrated twice during this period, once at the beginning of its operation in July of 2001 and the second time in November of 2001.

April/2002 – December/2002

- a. The logging system was programmed to read gas concentrations every 60 seconds. Every hour the system processed the readings taken every 60 seconds and stored the highest gas concentration reading within that hour. The system operated 24 hours a day.

- b. Remote communications with the system were established on a weekly basis to monitor the operation of the system, perform data analysis and real-time tracking.
- c. Download of stored data was done on a monthly basis via remote communication. The data was analyzed and organized using Microsoft Excel.
- d. The system was calibrated only once during this period in March of 2002.

DATA PRESENTATION

Once the data was downloaded, it was then organized and prepared using Microsoft Excel for analysis and presentation. The gas monitoring results for the 18 months that the system was in place and in operation are presented in Appendix C. The following is just an example of how the data was organized for presentation.


 California Integrated Waste Management Board 1001 I Street - Sacramento, CA 95812 Permitting and Enforcement (CIA Unit)									
Methane Concentrations <u>Newport Terrace Condominiums</u> (Gas Concentration Readings/July 2001)									
DESCRIPTION: Gas Monitoring Sensors (Methane) UNIT ID: HL Continuous Monitoring Equipment UNIT NAME: Hyperlogger SESSION: # 1 starting Tue Jul 10 13:32:31 2001 SAMPLING FREQUENCY: Hourly TOTAL SENSORS: 9									
July-01									
METHANE CONCENTRATION (ppm)									
DATE/TIME mm/dd/yy hh:mm:ss	SENSOR ID								
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 8	No. 9	No. 10
07/10/01 13:32:31	2588.43774	-1398.46887	5149.00049	-2171.75024	2708.25024	-2401.25024	2209.37524	-2378.50024	3078.12524
07/10/01 14:32:31	-2578.75146	4333.37793	-721.781616	-2974.25146	-1764.71948	-2710.93896	-2108.81396	2992.18896	-2217.68896
07/10/01 15:32:31	-2556.06396	2192.12646	420.164246	-2435.68896	-175.183685	-2653.87646	-2068.62646	3765.93896	-2252.06396
07/10/01 16:32:31	402.961121	-78.7480927	-612.062866	3121.12646	-2465.18896	3190.12646	2810.81396	-2613.12646	1375.93823
07/10/01 17:32:31	-2516.18896	1081.37573	1115.81323	-2481.75146	513.344116	-2636.68896	-2068.62646	3740.50146	-2229.18896
07/10/01 18:32:31	-917.281616	-1621.87573	4959.87793	-2378.00146	3491.25146	-2636.68896	-898.140991	-302.398621	58.8818588
07/10/01 19:32:31	-2550.62646	4644.50293	-588.297241	857.609741	-2459.00146	-1132.87573	-1373.96948	1572.81323	-2263.62646
07/10/01 20:32:31	-2550.62646	3095.31396	-37.4785385	-1948.15698	-1012.31287	-2665.68896	-1115.62573	4351.87793	-2223.56396
07/10/01 21:32:31	1410.31323	-756.156616	-601.406616	3061.00146	-2309.62646	3060.93896	4076.50146	-1362.90698	1649.43823
07/10/01 22:32:31	-1478.31323	1014.85974	-618.609741	4350.50293	-2275.50146	3897.06396	1259.03198	-1197.00073	-2057.18896
07/10/01 23:32:31	1777.78198	-1460.09448	5756.25293	-1615.09448	3103.93896	-2510.68896	3086.68896	-1156.34448	3181.37646
07/11/01 00:32:31	-312.890808	289.570496	-571.094116	4162.50293	-2183.43896	3844.50146	2260.00146	-1093.78198	-904.531616
07/11/01 01:32:31	2656.12646	-1494.53198	5032.87793	-1546.21948	1795.00073	-1873.43823	4240.62793	-1081.18823	4326.75293
07/11/01 02:32:31	3009.25146	-1448.96948	-1121.90698	1993.68823	-2217.87646	2191.12646	5515.12793	-1042.15698	3620.06396
07/11/01 03:32:31	-2521.68896	-1489.46948	2759.87646	-1575.46948	2131.37646	-2653.87646	-708.797241	4300.25293	-2051.43896
07/11/01 04:32:31	3172.75146	-1472.25073	4514.62793	-1386.21948	1441.00073	-1660.78198	4387.75293	-967.000366	4007.62646
07/11/01 05:32:31	2217.43896	-1466.18823	5436.37793	-1483.40698	2622.25146	-2401.25146	3654.50146	-904.531616	3602.87646
07/11/01 06:32:31	-2476.25146	1002.76599	1174.96948	-1546.21948	324.000183	-2653.87646	-605.515991	5451.00293	-2080.12646

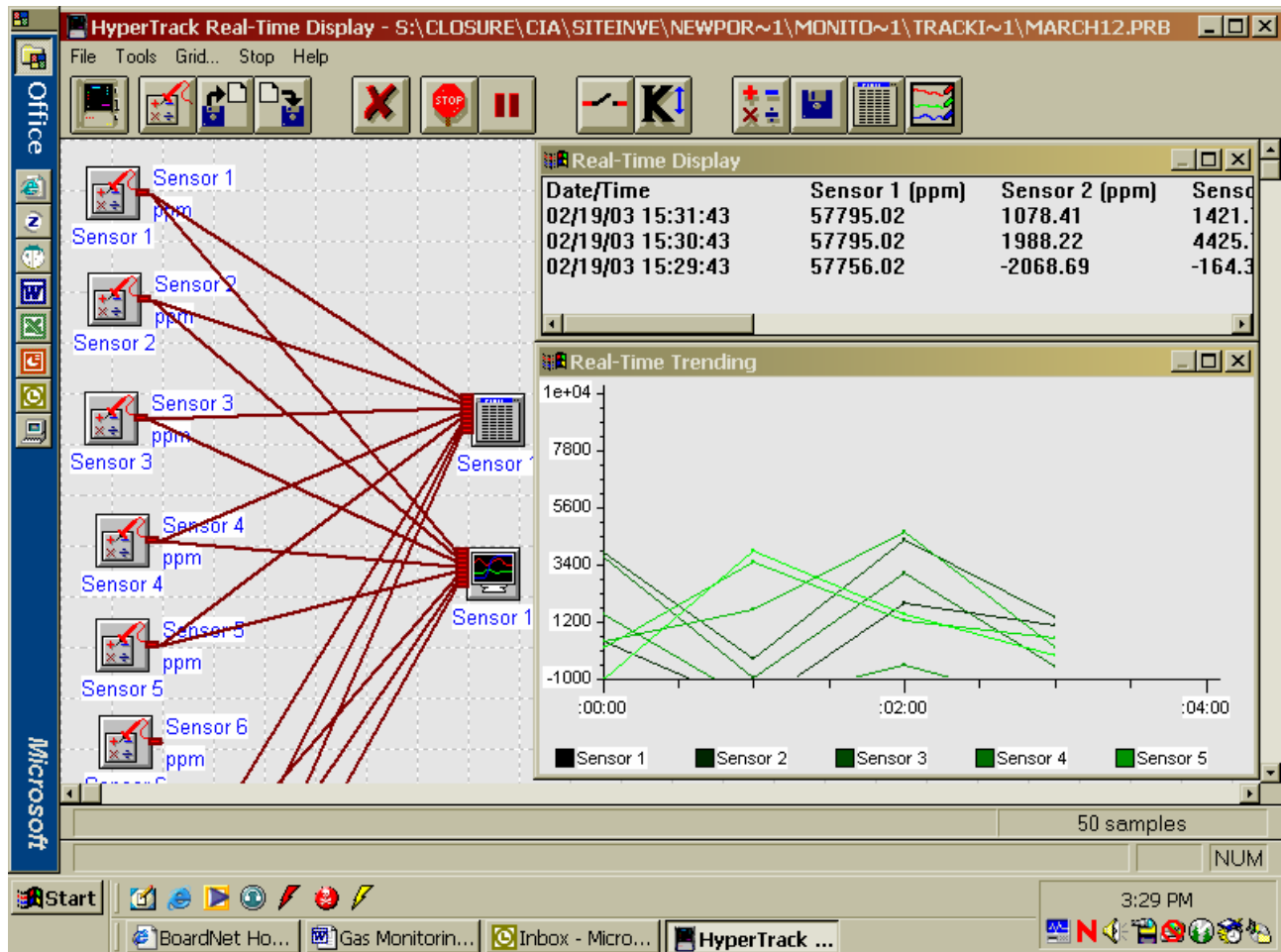
Table 1 describes the operation of each one of the sensors throughout the 18-month period:

Sensor No.	Sensor Operation Report	
	Times Detecting CH ₄ Above LEL	Other Comments
1	0	Normal Operation
2	0	Normal Operation
3	0	Normal Operation
4	0	Normal Operation
5	0	Normal Operation
6	0	Put out of line in Nov-01
7	0	Affected by irrigation system in Dec-01
8	0	Normal Operation
9	0	Normal Operation
10	0	Normal Operation

Table 1. Sensor Operation Report

After analyzing the gas monitoring data using the continuous gas monitoring system in Newport Terrace Condominiums, it was found that the sensors did not detect concentrations above the regulatory limits for methane gas in the facility structures, being the regulatory limit 25% of the LEL or 1.25% by volume. It is important to say that on several occasions, readings were observed above the regulatory limits. When this occurred, CIWMB and LEA staff performed inspections of the system and it was determined that these anomalies were due to lack of calibration in one of the sensors.

The graphic below displays an example of a real-time tracking screen done at a certain time for the Newport Terrace Project.

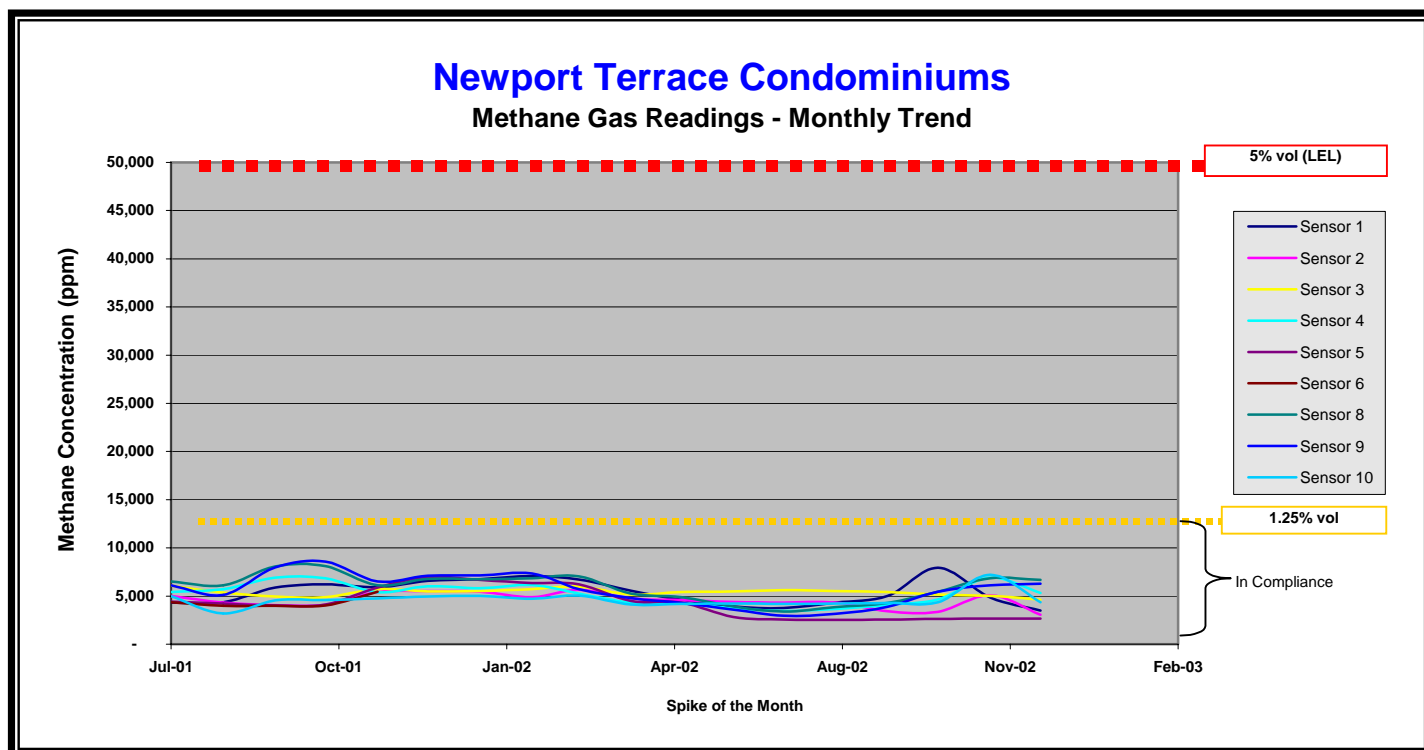


The real-time tracking software offered the capability to display numerical information about the gas concentration being read onsite by the sensors as well as a graphical trend of the gas readings. Through real-time tracking, CIWMB staff was able to identify any potential gas migration that could have occurred at the site while monitoring, and simultaneously check for normal operation of the system including sensors and controller. Once again, the advantage that this system offered was the ability to perform all the monitoring and control activities from a remote computer 450 miles away from the project site.

GAS MONITORING RESULTS

Month	METHANE CONCENTRATION (ppm)								
	SENSOR ID								
	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 8	Sensor 9	Sensor 10
Jul-01	4316.1	5015.6	6070.0	5416.6	4428.6	4370.5	6503.5	6104.4	4996.4
Aug-01	4342.6	4318.8	5342.9	5708.9	4206.1	4000.5	6121.5	5134.0	3198.6
Sep-01	5876.8	4067.4	4969.5	6899.5	4007.6	3991.4	8093.1	7972.6	4558.5
Oct-01	6210.9	4093.7	4893.1	6865.0	4128.1	4025.9	8104.4	8574.8	4602.3
Nov-01	5918.3	5429.0	5733.3	5399.4	5869.8	5453.5	6131.9	6503.5	4757.3
Dec-01	6576.3	5515.1	5488.0	6028.6	6979.0		6772.4	7110.4	4946.8
Jan-02	6734.0	5468.1	5522.4	5829.3	6675.8		6751.1	7146.9	5008.1
Feb-02	7082.4	4877.9	5701.8	6142.1	6341.8		6847.9	7351.6	4705.6
Mar-02	6699.5	5660.1	5987.1	5264.3	6221.3		7054.4	5704.5	5067.4
Apr-02	5548.8	4742.4	5154.3	4313.5	4478.8		5242.3	4795.8	4133.9
May-02	4631.8	4595.8	5418.9	4219.8	4305.6		4898.8	4280.5	4177.4
Jun-02	3918.9	4397.9	5497.4	3738.4	2829.3		3911.7	3584.6	4211.8
Jul-02	3747.4	4330.6	5607.5	3446.9	2545.8		3387.4	2958.0	4177.4
Aug-02	4322.8	4314.9	5521.8	3669.9	2537.5		3842.9	3164.1	4211.8
Sep-02	5036.3	3438.9	5428.8	4099.6	2545.8		4297.6	3885.4	4280.5
Oct-02	7950.8	3369.9	5139.3	4648.9	2640.5		5465.6	5448.4	4366.4
Nov-02	4856.2	5078.1	5024.5	6914.9	2648.8		6839.6	6101.1	7206.6
Dec-02	3478.5	3069.6	4614.6	5335.5	2648.8		6678.4	6279.8	4349.1

Table 2. Gas monitoring results for the 18 months that the system was in operation. Readings represent the highest within that particular month.



Graphic 1. Gas monitoring trend, monthly readings

DATA ANALYSIS

Statistical analysis is provided below to show the consistency of the data gathered by the continuous gas monitoring system.

<i>Sensor 1</i>	
Mean	5402.669586
Standard Error	304.9287572
Median	5292.50293
Standard Deviation	1293.703152
Sample Variance	1673667.845
Count	18
Confidence Level(80.0%)	406.5857498

<i>Sensor 3</i>	
Mean	5395.273546
Standard Error	88.89853975
Median	5458.37793
Standard Deviation	377.1645618
Sample Variance	142253.1066
Count	18
Confidence Level(80.0%)	118.5354893

<i>Sensor 5</i>	
Mean	4224.38052
Standard Error	374.1903987
Median	4167.126465
Standard Deviation	1587.55541
Sample Variance	2520332.181
Count	18
Confidence Level(80.0%)	498.9378018

<i>Sensor 8</i>	
Mean	5941.356717
Standard Error	333.3343007
Median	6317.69043
Standard Deviation	1414.217666
Sample Variance	2000011.608
Count	18
Confidence Level(80.0%)	444.4611188

<i>Sensor 10</i>	
Mean	4608.648465
Standard Error	185.7025331
Median	4462.439453
Standard Deviation	787.8691228
Sample Variance	620737.7546
Count	18
Confidence Level(80.0%)	247.6119483

<i>Sensor 2</i>	
Mean	4543.544
Standard Error	179.5133
Median	4496.815
Standard Deviation	761.6106
Sample Variance	580050.6
Count	18
Confidence Level(80.0%)	239.3594

<i>Sensor 4</i>	
Mean	5218.947
Standard Error	266.5758
Median	5367.44
Standard Deviation	1130.985
Sample Variance	1279128
Count	18
Confidence Level(80.0%)	355.4467

<i>Sensor 6</i>	
Mean	4368.352
Standard Error	280.3812
Median	4025.876
Standard Deviation	626.9514
Sample Variance	393068.1
Count	5
Confidence Level(80.0%)	429.882

<i>Sensor 9</i>	
Mean	5672.239
Standard Error	389.6752
Median	5902.815
Standard Deviation	1653.252
Sample Variance	2733241
Count	18
Confidence Level(80.0%)	519.5849

EXPLANATION OF GAS READINGS IN APPENDIX A

Date	Event	Action Taken
July 10, 2001	Beginning of monitoring program	System Initialized and Calibrated (Sensor # 7 was never operational)
August 7, 2001	Fuse in controller blew	Fuse was replaced and system calibrated
October 21, 2001	Power surge/System reset	System put back in operation and calibrated
November 28, 2001	Water got into sensor # 6/Sensor broke	Sensor was disconnected and system calibrated
October 22, 2002	Sensor # 1 stopped operating	Decided not to replace, since monitoring program was close to be completed.
December 10, 2002	End of monitoring program	System stopped.

CONCLUSIONS

Based on the field monitoring results and the gas concentrations obtained using the continuous gas-monitoring system, regulatory limits for explosive gas levels (25 percent of the LEL for methane) were not exceeded in facility structures pursuant to Title 27 California Code of Regulations (CCR) Section 20919.5 and 20921.

For the rules regarding landfill gas monitoring and control see:

<http://www.ciwmb.ca.gov/regulations/title27/ch3sb4b.htm#Article6>

However, no other particular conclusions can be drawn as to the gas levels in areas outside of the monitoring net installed at this site for the purpose already stated in this report. Furthermore, this report does not relieve the present owner as well as the former operator of any liability for past, present and future operations at the site. Nor does it relieve them of the responsibility to clean up existing, additional, or previously unidentified conditions at the site that could pose a threat to public health and safety, and the environment.

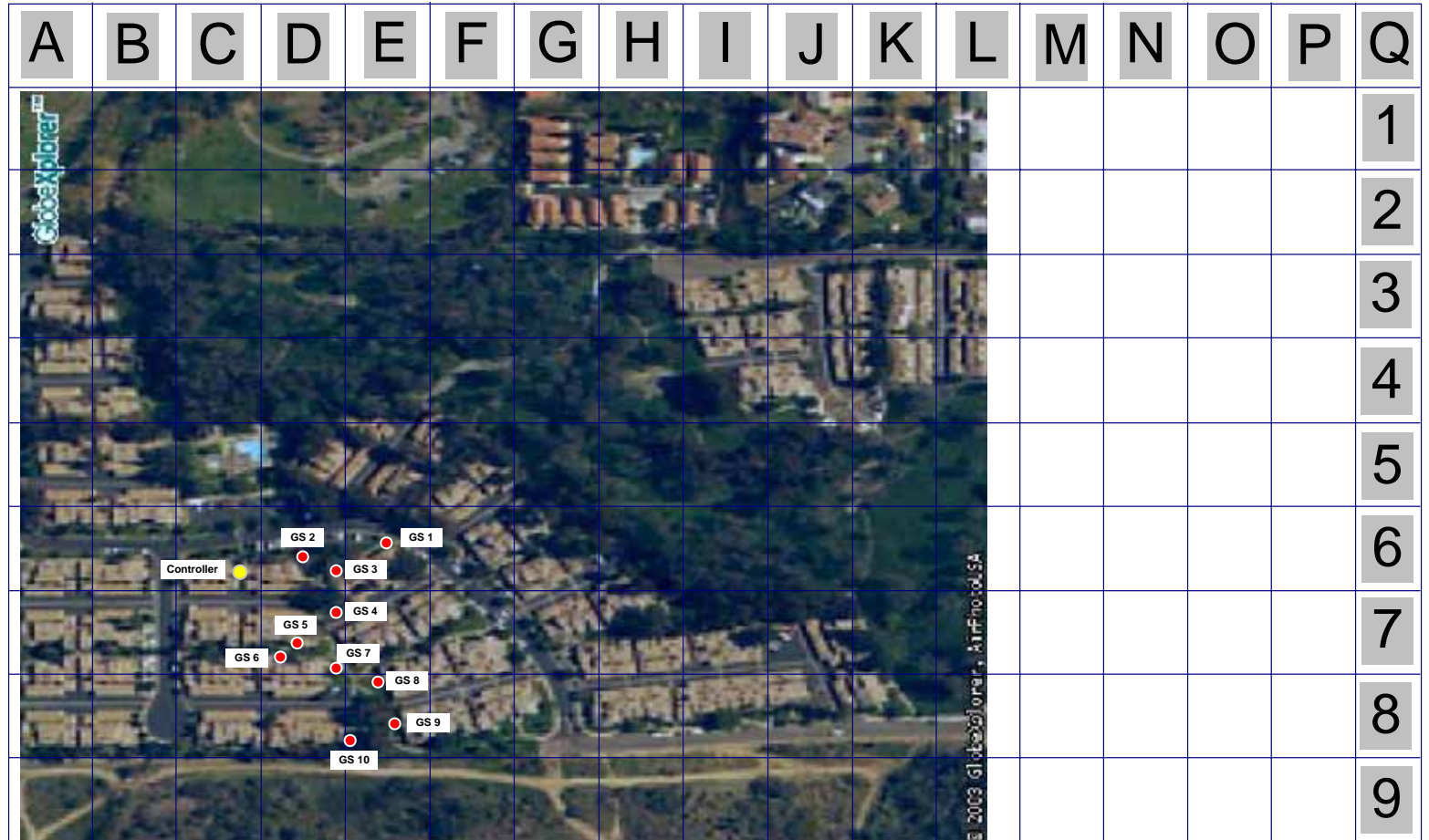
Appendix A

GAS SAMPLING LOCATIONS



SENSOR LOCATIONS

- Sensor 1 ---> Grid E6
- Sensor 2 ---> Grid D6
- Sensor 3 ---> Grid D6
- Sensor 4 ---> Grid D7
- Sensor 5 ---> Grid D7
- Sensor 6 ---> Grid D7
- Sensor 7 ---> Grid D7
- Sensor 8 ---> Grid E8
- Sensor 9 ---> Grid E8
- Sensor 10 ---> Grid E8



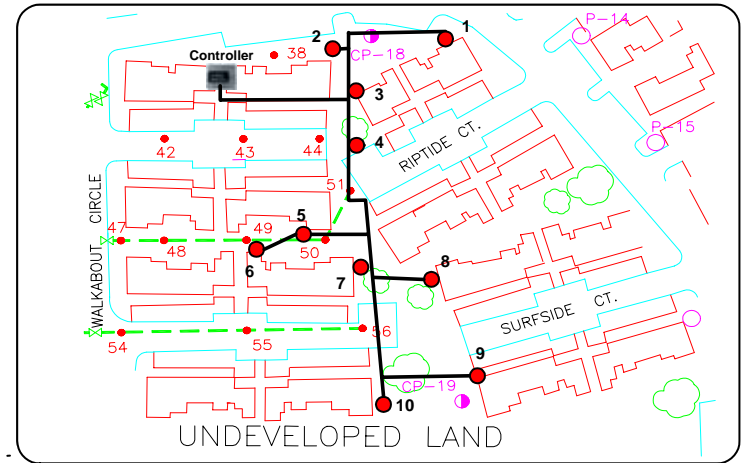
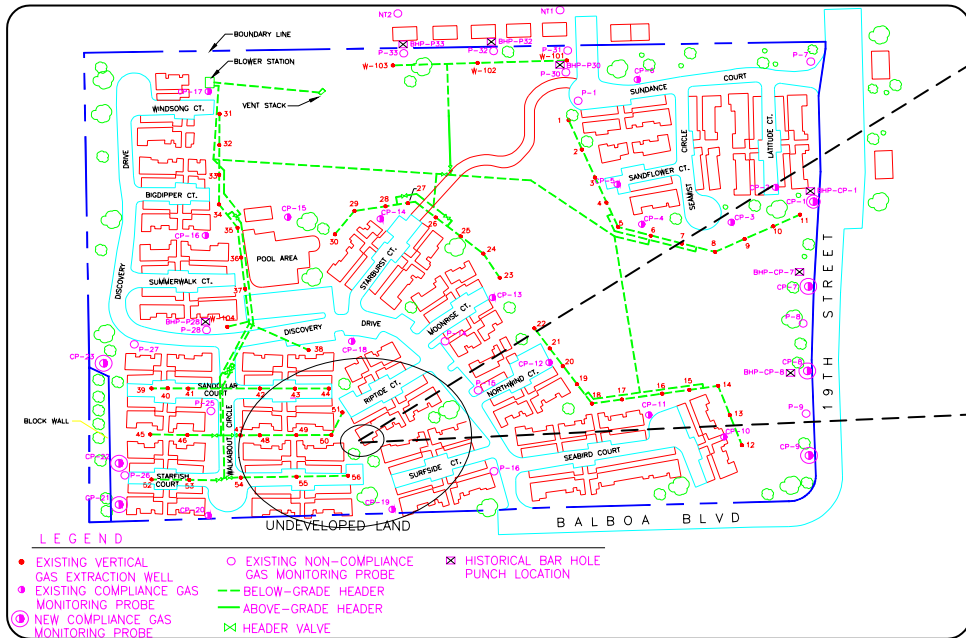
Not to Scale

Comments:

- Gas Monitoring Sensor
- Control Panel



<p>California Integrated Waste Management Board 1001 I Street - Sacramento, CA 95814 (Closed Illegal & Abandoned Sites Investigation Unit)</p>	
<p>Date: February 20, 2003</p> <p>Prepared By: CIWMB</p>	<p>Sensor Location Map Newport Terrace Condominiums - Newport Beach, CA</p>



X210 (MULTI-CHANNEL DETECTOR)



METHANE SENSOR (10)

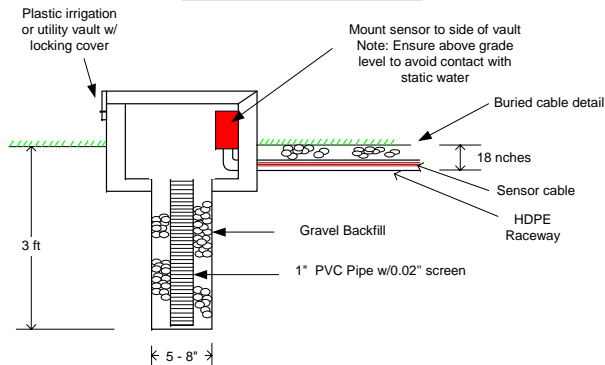
SENSOR CABLE LAYOUT

Review existing site utility maps as well as site configuration to determine best location to layout.

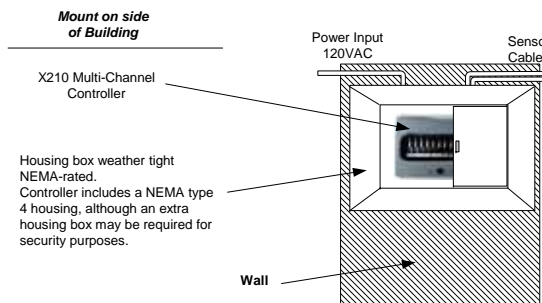
Notes:

1. Davis Instruments Multi-Channel Gas Detector Model X210 for 10 Channels. Catalog No. UP7901909, Operating Power 115+/- 10VAC/ 220VAC 50/60Hz or 24 VDC.
2. X210 Dimensions: 24"Wx20"Hx8"D
3. Panel Box: NEMA type 4 panel enclosure (included), an extra housing box is needed for security purposes, weather tight NEMA-rated.
4. Cable Length: #22 or #20AWG Shield, 3 conductor cable, up to 3000 ft.
5. Sensors Required: Total of 10 Methane sensors. Model S210R8
6. Sensor cables buried at minimum depth of 18" enclosed in HDPE conduit (please review site configuration to determine best location to bury the cables).
7. Drawing not to scale.

Sensor Installation Detail



Multi-Point Gas Controller



California Integrated Waste Management Board
1001 I Street - Sacramento, CA 95814

Permitting & Enforcement
(Closed Illegal & Abandoned Sites Investigation Unit)

Date: 06/26/2001

Prepared By: Abel Martinez-Centeno

Continuous Gas Monitoring System
Newport Terrace Condominiums

Appendix B

PHOTOGRAPHIC LOG



Exhibit 1. Newport Terrace Surrounding Areas

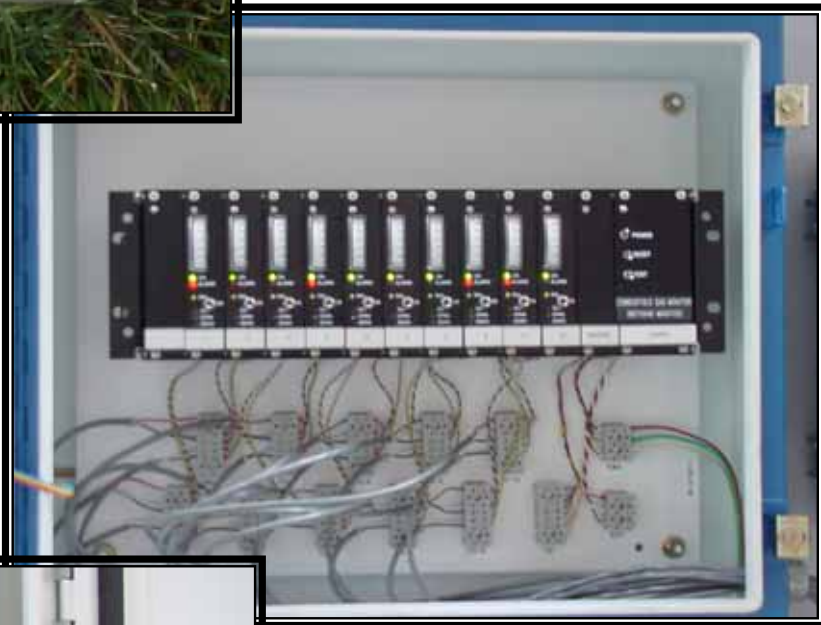


Exhibit 2. Continuous Gas Monitoring Equipment

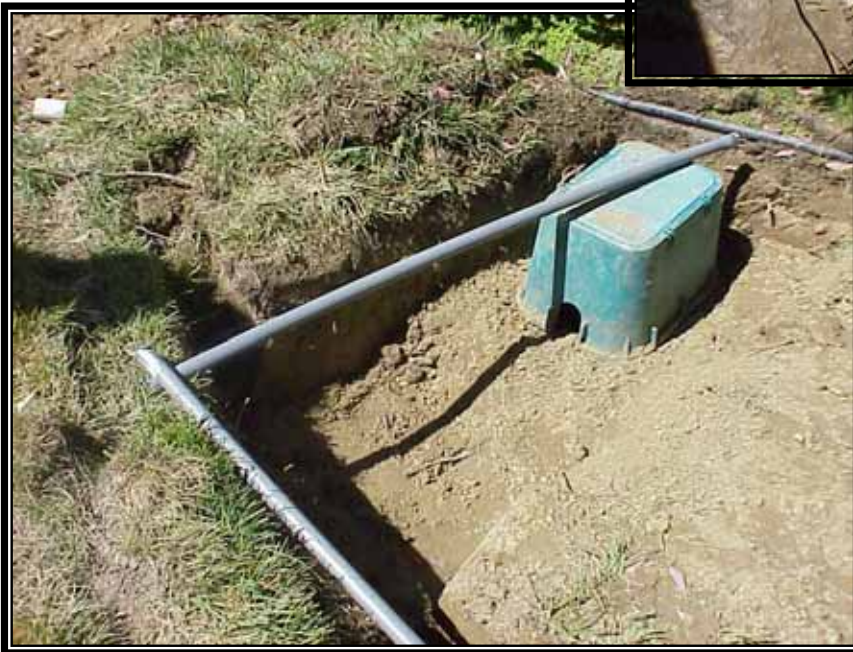


Exhibit 3. Details of Probe Construction



Exhibit 4. Details of Sensor Installation and Calibration

References

1. Final Gas Investigation Report – Newport Terrace Landfill, SWIS # 30-AB-0168, CA Integrated Waste Management Board, Sacramento, CA, 2001.
2. Landfill Gas Characterization, CA Integrated Waste Management Board, Sacramento, CA 1998.
3. Landfill Gas System Engineering Design, Design Manual, CES-Landtec, Colton, CA 2002.
4. Richard J. Watts, “Hazardous Wastes”, John Wiley & Sons, Inc. New York, 1997.
5. Site Specific Health and Safety Plan for Gas Investigation at the Newport Terrace Landfill, SWIS 3 30-AB-0168, CA Integrated Waste Management Board, Sacramento, CA, 2001.
6. Use and Installation of USI’s Multi-channel Combustible Gas Detector, Operation Manual, U.S. Industrial Products Co., Inc., Cerritos, CA 2000.
7. Section 20919, 20919.5, and 20931 of Article 6, Division 2, Title 27, California Code of Regulations. State Minimum Standards for Gas Monitoring and Control at Closed Disposal Sites.
8. Section 44100, Public Resource Code, Authority to Conduct Investigations at CIA Sites.
9. Section 18083, Title 14, California Code of Regulations, Duties and Responsibilities for Inspections.
10. Section 44106, Public Resources Code, Enforcement of State Minimum Standards at CIA Sites.

Appendix C

GAS MONITORING RESULTS